THE
VETERINARY JOURNAL

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APRIL, 1938

Biography

The Chief Veterinary Officials of the Ministry of Agriculture and Fisheries.
(*Appointment to take effect on June 1st, 1938.*)

SIR JOHN KELLAND, M.R.C.V.S., Chief Veterinary Officer of the Ministry of Agriculture and Fisheries, is retiring from the public service on reaching the age limit. His retirement, which would normally have taken place at the beginning of March, was deferred at the request of the Minister until the transfer of Local Authority veterinary services to the State under the Agriculture Act, 1937, had been effected, and will date from June 1st. That Sir John has had many very anxious moments over the Foot and Mouth question—especially during the last few months—is certain; and the way he has firmly stuck to the stamping-out policy is to be admired. His name will always go down to humanity for the way he handled so successfully the measures associated with the Exportation of Horses Bill, and thus put an end to the decrepit horse traffic which was rightly labelled at the time as "England's shame." For his never ceasing and strenuous work on their behalf—often in the face of personal danger and always of great difficulty and discomfort—the old horses of Great Britain owe more than to any other man.

Mr. D. A. E. Cabot, M.R.C.V.S., who has held the post of Deputy Senior Chief Veterinary Officer since 1932, has been appointed to be Chief Veterinary Officer as from the date of Sir John Kelland's retirement, and Capt. Robert Simpson, F.R.C.V.S., D.V.S.M., Superintending Veterinary Inspector, to be a Deputy Chief Veterinary Officer in succession to Mr. Cabot.

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After qualifying in 1910, Mr. Cabot was appointed House Surgeon at the Royal Veterinary College and joined the staff of the Ministry (then the Board) in 1911. In the following year, he visited India to assist in the work of the Foot and Mouth Disease Committee (1912) which was carried out at the Bareilly branch of the Imperial Bacteriological Institute, Muktesar.

Mr. Cabot succeeded Sir John Kelland as Secretary of the Foot and Mouth Disease Committee, 1919-1920, the work of which was originally done in a converted sloop stationed at Harwich. He is a member of the Standing Committee on Animal Health of the Colonial Advisory Council of Agriculture and Animal Health, and has represented Great Britain at meetings of the International Veterinary Bureau (Office International des Epizooties) Paris.

Captain Simpson is so well known to his brother members for the energetic work he put in during his year of office as President of the National Veterinary Medical Association that his name needs no introduction to the profession. Suffice it to say that this, combined with the reputation he brought away from the County of Cumberland for good organisation and good work done, makes his colleagues in the profession applaud the selection made by the Minister of Agriculture and Fisheries for the great task which is now in front of the new Veterinary State Service.

Editorial

THE STATE VETERINARY SERVICE

STARTING on the first of this month the State Veterinary Service has come into being and its progress will be watched critically by every member of the profession as well as by the farmers and stockowners of the country.

The country has been mapped out and divided up into some 22 areas and 78 divisions and the veterinary staffs have been allotted in accordance with the respective needs—as considered necessary by the responsible officials at the Ministry of Agriculture.

The gathering together of such a strong and centrally-controlled staff has been very opportune just at the moment, as the troublesome and extensive outbreaks of Foot and Mouth Disease would otherwise have strained the resources of the already overworked practitioner, who must still play an important part in the preventive and curative treatment of all diseases, contagious and otherwise. Where the strain of this Foot and Mouth outbreak has passed, the Veterinary State Service officers will commence in earnest their crusade against tuberculosis.

Tuberculosis, however, is not the only disease to be tackled for there are many districts in Great Britain where the stockowner has tangible evidence that contagious abortion and mammitis cause an even greater toll of loss. Although

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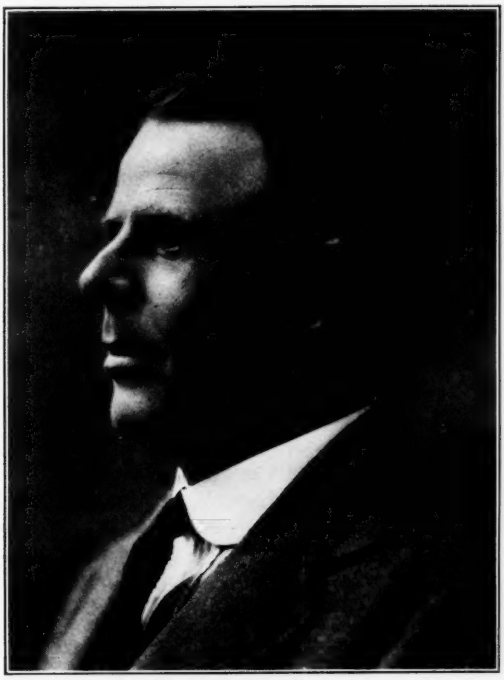

Capt. Robert Simpson, M.R.C.V.S., D.V.S.M.
Deputy Chief Veterinary Officer

not yet scheduled there is every reason to hope that they are both marked down and that the time will not be long before these two diseases at least will be officially dealt with.

Whether eventually all contagious diseases will be dealt with by whole-time officers and taken completely out of the hands of the part-time practitioner remains to be seen, but there is no doubt that there will be cases of appointments which will need tactful and careful adjustment; for to be only offered the opportunity to apply for Panel B—whereas Panel A has been anticipated—means not only pecuniary loss but loss of prestige; and some country practices cannot be maintained without the pecuniary aid which a Ministry of Agriculture Inspectorship gives.

True it will all eventually adjust itself, for the average Britisher is usually practical and fair in his thoughts and ideas and we are sure that the new Veterinary State Service will eventually play as large a part in the social and scientific life of the profession as has the panel practice scheme in that of our medical confrères.

If, too, Mr. Morrison's Abattoir Schemes mature there will be very many good openings for the incoming generation, although we can hardly expect the lavish official staffing which marks the thoroughness with which our German and Dutch neighbours carry out their meat inspection duties. Some of the larger Continental Abattoirs (take Berlin for an example), have as many as fifty whole-time Veterinary Meat Inspectors, all well-paid men whose duty is entirely concerned with the flesh of the dead animal; and there are also another fifty whose duties lie in the inspection of the live animal either on the railway or in other places before they enter the precincts of the abbatoir where the killing is to take place. Our so called "Meat Inspection" in England is the laughing stock of our Continental friends and the ancient Abattoir of the greatest city in the world might truthfully have attached to it the reproach which, until recently, was attached to the Royal Veterinary College, viz., that of being a National Disgrace?

It is estimated that this intensive crusade against cattle diseases will cost the taxpayer some £600,000 annually for four years, but even this amount is small when one realises that the animal loss from preventable disease averages some £14,000,000 annually.

Truly the veterinary profession has at last come into its own; and it is quite right that it should do so, for it plays as important a part in the life and economy of a nation as that of any other profession or calling and cannot be done without.

At present we are only on the fringe of the work, for the owners of the pig, the sheep, and the poultry, all have an equal right to claim the help of the Veterinary State Service, just as much as the owners of the horse and the cow; and the time will come when the most numerous of any—the dogs and the cats—will also have to come into line. To train and supply sufficient men to fill the positions will strain the resources of our teaching colleges to the utmost for some years to come.

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General Articles

OCCUPATIONAL DISEASES IN VETERINARY SURGEONS *

A Survey

By Professor AXEL THOMSEN, Dr.Med.Vet.
From the State Veterinary Serum Laboratory, Copenhagen

*By the courtesy of the Editor of *Skandinavisk Veterinärtidskrift*

INTRODUCTION

THE many affections which in recent years generally are grouped under the term " occupational diseases " are very difficult to mark off, and the border lines we lay down in this respect are, and will always be, more or less artificial—to some extent depending upon the aim in dealing with these diseases.

Nevertheless, it may be appropriate in various ways to reckon with occupational diseases as definite groups of diseases deserving special attention—and this, I hope, will be evident from my inquiry into the occupational diseases of the veterinary profession.

From the questionnaire I sent in October, 1935, to nearly all the veterinary surgeons in this country, it was clear that I wished to limit the field of investigation to infectious diseases transmitted from domestic animals, allergic diseases, and idiosyncrasies to pharmacological preparations. In my opinion, it would be too much to include the traumatic injuries, which are not infrequent in the practice of veterinary medicine (*e.g.*, rough animals, automobile accident, etc.), and also affections as rheumatism, sciatica, colds and illness from over-exertion (often with a heart lesion)—diseases which really accompany to some extent the physical work of a veterinary surgeon; and, as far as that goes, might be called occupational diseases, although they are encountered in many other occupations, and hence they cannot be said to belong to veterinarian occupational diseases in the stricter sense of the term.*

Of the aforementioned questionnaries a total of 960 were sent out—that is, to all the veterinarians whose addresses were in the Veterinary Directorate in Autumn, 1935. I received 706 replies.

Several of those cases of occupational diseases which I have picked out from the reports and taken into account in the present survey were actually acquired by the respective veterinarians during the latter part of their college years.

* In Germany, Ingeborg Jopke has studied certain occupational diseases in veterinarians: *Infektiöse Krankheiten der Haustiere als Berufskrankheiten von Tierärzten.* Dissertation. Breslau, 1934. Likewise Poppe, Tierärztliche Rundschau, 35: 289, 1929.

Fig. 1. TRICHOPHYTIA PROFUNDA IN THE BEARD: MOIST, CRUST-COVERED ATYPICAL KERION FORMATION (*after* Rasch).

Fig. 2. ANTHRAX OF LEFT HAND OF VETERINARY SURGEON (ASSOCIATED WITH HIGH FEVER). IN HOSPITAL FOR 17 DAYS. IN THE DEEP NECROTIC ULCER ONE TENDON IS UNCOVERED. IT TOOK 4 MONTHS FOR THE WOUND TO HEAL, WITH FORMATION OF A LARGE DISFIGURING SCAR.

ARTICLE BY AXEL THOMSEN. PAGE 140.

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I have paid no regard to this time factor, as it seems rather immaterial, for instance, whether a condition of skin tuberculosis is acquired during the student's instruction in meat inspection or after his graduation when he holds a position as meat inspector. Recurrent affections—*e.g.*, ringworm—are entered only once even when they appear several times in the same person.

Further, it is to be pointed out that the fatal cases of occupational diseases are dealt with somewhat incompletely because it has not been practicable to obtain more complete data about them. Even a review of the obituaries in the veterinarian journals gives but scanty information—but we all know that fatal cases of occupational diseases do occur within our profession.

Finally I have to mention that the data I have received from the respective veterinarians as a rule were based on memory, not on records, and this circumstance naturally detracts somewhat from the absolute reliability of the collected material. Still, it is reasonable to assume that the diagnoses on the whole have been correct although a good many instances of occupational diseases may have been forgotten in the course of time.

Negative Group.

Among the total 796 reports received 185 were from veterinary surgeons who, as far as they knew, had never had any occupational disease or shown any sign of idiosyncrasy for the more common pharmacological preparations. Of these veterinarians, I think, it may rightly be said that they have been lucky and also in possession of very good constitutions.

It is only natural that the average age is somewhat lower than that of the positive group (veterinarians with a history of occupational disease). The average age of the former is 44–9 years, of the latter 47–9. But this difference really is smaller than might have been expected, undoubtedly because the negative group includes a good many old veterinarians who have not practised for a number of years and easily may have forgotten an attack of some occupational disease long ago.

Naturally the particular kind of work carried out by the respective veterinarians will play a decisive rôle in the occurrence of occupational diseases. Thus the public health officers (meat inspectors) are relatively favourised by circumstances. Among the 185 veterinarians in the negative group 39 reported that meat inspection was their only—or at any rate their chief—occupation, whereas 88 gave practice as their only or chief occupation. In a similar number of cases picked out at random from the positive group only 17 gave meat inspection as their chief occupation, while 110 were practitioners.

On taking at random 25 veterinarians with practice as their sole occupation, they presented altogether 46 instances of occupational diseases (idiosyncrasies not included), while 25 meat inspectors (also picked out at random) showed 40 instances of such affections. The reason why the difference is not greater is

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no doubt attributable to the fact that many meat inspectors had been practitioners prior to their appointment as health officers.

Apart from this, the negative group really tells us nothing. One might perhaps have expected that this very group would give us some valuable suggestions as to how certain occupational diseases might best be prevented. But it fails to do so. It is obvious, of course, that veterinarians who are not occupied with practical veterinary work are to be found in this group.

Positive Group.

Altogether 611 veterinarians have reported that they have been suffering from one or several of the diseases or abnormal conditions that will be dealt with in the following.

No attempt will here be made at a detailed clinical presentation of the cases with references to the literature concerning the various affections. That would fall outside the scope of this paper. Except for a few remarks on the clinical aspects, the reader is referred to the special text books of medical and veterinary science.*

Infectious Diseases.

1. **Ringworm.** Ringworm is one of the infectious occupational diseases encountered most frequently in veterinarians. I shall here deal with this lesion as a nosographic unit even though it may be produced by many different fungi and also appear clinically in essentially different ways.

The frequency of ringworm among veterinary surgeons is evident from the fact that no less than 159 reported they had been attacked by this disease—many of them even several times.

As a rule the infection is acquired from calves or cows—from the latter, in particular, on rectal examination and obstetrical aid, as ringworm in the cow is often localised to the root of the tail. In some cases the horse and swine are given as sources of infection.

The lesion most often appears as circular, reddish, scaling lesions of the epidermis, as a rule located on the arms, wrists or hands of the veterinarians; but it may also appear on the shoulder, neck, chest, back and, especially, the face (chin).

As is well-known this disease usually takes a benign course under treatment with various mild therapeutics. But this is by no means always the case. Sometimes, and not infrequently, it may be more malignant and very refractory to treatment. Some veterinarians have been troubled with this lesion for months—even for years. In the more malignant cases the infection may gradually become

* Among many others, the following may be mentioned: C. Rasch: *Hudens Sygdomme.* Copenhagen, 1927. Faber, Holst and Petrén: *Lærebog i intern Medicin.* Copenhagen, 1934. Lexer: *Lehrbuch der allgemeinen Chirurgie.* Vol. I. Stuttgart, 1928. Hutyra and Marek: *Spezielle Pathologie und Therapie der Haustiere.* Jena, 1922.

febrile and painful, developing into a suppurative folliculitis, sometimes extensive, sometimes more local, in some cases with tumor-like protruding patches, especially in the bearded parts of the face—a form designated as *kerion Celsi* or *trichophytia profunda* (Fig. 1). Even though this condition may be very annoying, it usually marks the beginning of an approaching spontaneous recovery.

Also the finger nails may be involved, but only a few veterinarians have reported this localization.

Sometimes the deep forms of trichophytia are associated with the appearance of diffuse metastases, trichophytids. These deep forms often leave immunity.

As to the treatment of ringworm, it is to be emphasized that the lesion in many cases has yielded promptly to daily application of iodine, preferably an energetic application repeated 5—6 times on the first day of treatment. Many other preparations and methods have been recommended, among which may be mentioned: sulphur ointment (10%); naphthol ointment; yellow mercurial ointment; tincture of iodine + 25% *acetic acid*, equal parts; compresses with weak Lugol solution (1—3—500); application of creolin 85 + formalin 15; chrysarobin (2—10%); compresses with 1% sublimate solution; dressing with salicylic-sulphur ointment (*salicylic acid* 3, precipitated sulphur 3, vaseline 94).

It is to be mentioned in particular that many veterinarians have noticed an excellent effect from bandaging the affected area (at night) with odylen or mitigal, in substance or ointments. And several veterinarians with severe forms of the disease have obtained a rapid and complete recovery by application of X-rays, usually a single strong dose.

2. **Mange. Mite Infection of Hair Follicles, Acariasis.** Strange to say, mange is of rare occurrence in this material. Only 10 veterinarians have contracted the infection—presumably with sarcoptes—in 7 cases from mangy horses, and 1 case from swine, and 1 from a dog. The arms were involved in 3 cases, the legs and feet in 3 (infection probably transmitted through the bedding in the stable). The lesion appears to have subsided readily; mitigal is recommended for the treatment.

Two veterinarians report they have had mite infection of hair follicles; in one case the affection yielded readily to treatment with iodine.

3. **Erysipelas (Erysipeloid).*** Among the bacterial infections occurring as occupational diseases in veterinarians, erysipelas plays a rather important rôle, as 43 veterinarians report that they have gone through this infection.† As a rule the disease is acquired through cuts, tears or pricks in the fingers or hands during autopsy on hogs that have died with erysipelas—or by infection through a recent break in the continuity of the skin before the performance of such an

* Possibly true erysipelas and erysipeloid are not quite identical affections (difference in bacterial type?).

† In Maanedskrift for Dyrlæger, 28, 1916—17, several instances of occupational erysipelas in veterinarians are mentioned, among others, in a paper by C. O. Jensen.

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autopsy. In a few cases the infection is transmitted accidentally with the hypodermic needle during the treatment of sick animals. Most often the lesion is seen to proceed from the site of injury as a progressive dermatitis, dark red in colour. The inflammation, which is often accompanied by severe pain and itching, may spread to several fingers and up on the hand, but seldom up on the arm. The affection (on the hand) sometimes appears about like *erythema nodosum* in swine—that is, with quadrilateral elevated plaques. As a rule the disease takes a rather acute course, lasting from 8 days to 4 weeks, seldom longer as it has a marked tendency to spontaneous recovery; still, relapse may occur. Sometimes it is accompanied by lymphangitis with lymphadenitis, fever, etc., making the patient completely unable to work for some length of time; but this happens not frequently (7 cases). Also the more localized affections may be very annoying and incapacitate the patient for work, at least in part.

In veterinarians, I think, erysipelas infection is apt as a rule to take a more severe course than that of ordinary erysipeloid—presumably because of the particular modes of infection that apply especially to veterinarians: deep infection through the syringe needle, and so on.

The treatment usually consists in hot antiseptic compresses and elevation of the forearm. An excellent effect is obtained by instramuscular injection of 10—20 c.c. of anti-erysipelas serum. Naturally this treatment involves a chance of " serum sickness," and if the patient has received any serum injection previously the possibility of an anaphylactic shock after injection of anti-erysipelas serum has to be kept in mind.*

Finally I wish to mention that Professor Dahl-Iversen (surgery), University of Copenhagen, has called my attention to the excellent effect obtained by painting the erysipeloid with 10% *chromic acid*. If necessary, the application may be repeated after 3—4 days.

4. **Furunculosis. Carbuncles. Pustules.** *Furunculosis* is an extraordinarily frequent lesion among occupational diseases in veterinarians. No less than 133 veterinary surgeons reported that they had been attacked by this disease, and many of them several times.

The term " furuncle " is used here to designate a purulent inflammation with necrosis, produced by staphylococci, around the deeper parts of the hair follicles, while " furunculosis " signifies a repeated or multiple appearance of furnuncles. In these cases the furunculosis is located nearly always on the arms, but it may extend to the hands and the trunk. It may be accompanied by

* The various serum ampules distributed by the Danish State Serum Institute are accompanied by the following instruction:

" As every injection of heterogenous protein (serum, vaccine) may involve a certain risk if the patient is hypersensitive, it is advisable always to have adrenalin at hand when such injections are given.

Of a 0.1% solution of adrenalin 0.5—1 c.c. may be given intra-muscularly, or—in case of serious collapse—up to 0.5 c.c. intravenously, but very slowly."

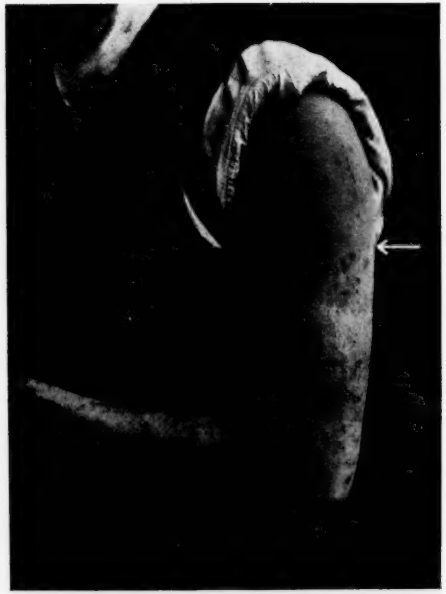

Fig. 3. TYPICAL CASE OF BRUCELLA SKIN ERUPTION IN A VETERINARY SURGEON.
Below the arrow: the spontaneous eruption. Above the arrow: eruption produced by application of abortin. The two eruptions look perfectly alike.

Fig. 4. "SPRING ERUPTION" ON ARM OF VETERINARIAN IN GENERAL PRACTICE, 66 YEARS OLD. THE ERUPTION HAS OCCURRED NOW AND THEN, MOSTLY IN THE SPRING, IN THE LAST 5–6 YEARS.
Application of amniotic fluid or clear vaginal discharge to the arm gives a similar eruption. Abortin test negative.

ARTICLE BY AXEL THOMSEN. PAGE 140.

lymphangitis and lymphadenitis, and then it is particularly apt to be very annoying. Somtimes the furuncles may have the character of carbuncles.

Furuncles develop especially when the work of the veterinary surgeon is associated with strong friction between the arms of the veterinarian and the infected genitial tract of the animal—that is, after loosening of a rotten placenta in the cow, and not infrequently after obstetrical aid, especially when the calf is rotten and emphysematous. Its appearance is relatively frequent also after treatment of the cow for metritis and after rectal examination. It seems as if irritating disinfectants (creolin and lysol) promote the development of this lesion. Furunculosis apparently leaves not infrequently some degree of immunity.

As a preventive measure it is recommended to rub the arms thoroughly with thick oil, camphor ointment, borated vaseline, etc. before commencing the work. After the work is over, the arms are to be washed in several basins of water and disinfected with chloramin solution. As to the treatment, it is to be mentioned that a beginning furuncle formation may often be checked successfully. For this, it is recommended to etch the red itching papule around the hair with pure carbolic acid, pure ichthyol, tincture iodine, or strong Lugol solution (1—3—10). A well-known veterinary surgeon of great experience recommends to hold a burning match close to the papule until a vesicle appears and then cover it with cotton and collodium.

Deep cauterization with a Paquelin burner is advisable in cases that have advanced a little more. In advanced cases various measures are recommended depending upon the condition: painting with iodine, phenol-mercury plaster, compresses with rivanol or sublimate solution. One veterinary surgeon has seen a very good result from vaccine therapy — something which probably deserves more attention.

Carbuncles. As mentioned, furunculosis sometimes goes on to form carbuncles—a serious lesion in which a group of deep furuncles fuse together, resulting in gangrenous processes with fever, etc. Eleven veterinarians have recorded the presence of carbuncles as a disease *per se*, and in these cases the carbuncles appear to have developed under similar conditions which are favourable to the production of furunculosis.

Pustules. Probably every veterinary practitioner knows from personal experience the superficial purulent inflammation of the hair follicles designated as pustules. This affection, which usually is localised to the arms, is so benign in its course that the greater majority of the veterinarians have not put it down in their reports. Only 11 veterinarians have recorded the occurrence of this affection and on this account, presumably, it will be correct to assume that it may take a more severe course in some cases. As a rule the pustules are recorded as appearing subsequent to a manual removal of the afterbirth.

Four veterinarians have reported " pustular eczema " after removal of the placenta, treatment for sterility, etc.

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5. **Cellulitis with Lymphangitis, Lymphadenitis and Abscess Formation.** To Danish veterinary practitioners, no doubt, the most important occupational disease is a Cellulitis with lymphangitis and lymphadenitis which ends as a rule in abscess formation. Two hundred veterinarians have had an attack of this disease—some of them several times. In some of these cases the lesion probably was a furuncle with lymphangitis, but in general the inflammation is so characteristic that a mistake in diagnosis is not apt to happen often. It will be justified, therefore, to speak of this affection as a special veterinarian lesion, often of a rather malignant character, with marked impairment of the general condition, fever, complete inability to work, sometimes for several weeks, In exceptional cases the abscesses have the appearance of carbuncles, and metastases are seen occasionally.

As a rule the lesion is located in the arms (especially the forearm), although the fingers and hands are involved not infrequently. It develops under the same conditions as furunculosis on removal of a rotten afterbirth, manual delivery of emphysematous and macerated calves (and pigs), treatment for metritis, examination for pregnancy, etc. Sometimes the infection develops through breaks in the continuity of the skin, present before or acquired during the work (in obstetrical cases) or through cuts in the hand or fingers (slaughter-house veterinarians). Many veterinarians claim that an attack of this disease often leaves some degree of immunity.

As to the prevention, the same holds good as is said about prevention of furunculosis. This point will be taken up again later on.

The treatment consists in bathing the affected part of the limb in hot soap-suds and in employment of hot antiseptic compresses (rivanol). Some veterinarians recommend the application of a layer of ichthyol (heated) covered with a light cotton bandage; this remedy is claimed to relieve the pain and shorten the inflammation, and also to cut short the abscess formation. A few veterinarians recommend vaccination.

In connection herewith it will be appropriate to mention that in addition to the cases already mentioned 72 veterinarians have reported they have had abscesses, while 10 stated they had had an attack of Cellulitis and in 9 accompanied by abscess formation—but none of these cases was associated with lymphangitis. For that matter, also these cases developed as a rule after obstetrical work. In some of them affection appears to have been furunculosis.

6. **Skin Tuberculosis (Tuberculosis verrucosa).** Skin tuberculosis is a not uncommon infection among veterinarians, especially meat inspectors, as 72 veterinarians report they have had an attack of this lesion; a few of them (4), however, have been in doubt about the correctness of the diagnosis. Some have had several attacks.

The term " skin tuberculosis " comprises a number of different lesions. In his book, Rasch mentions no less than 11 different forms. It is not practicable

from the reports received to decide with certainty the form of skin tuberculosis present in the various individual cases. Yet, it may properly be said that in a great majority of these cases it has been primary verrucose tuberculosis. Only in quite exceptional cases has there been a tuberculous ulcer.

As a rule this infection makes its first appearance in the form of a little red nodule, which subsequently goes on to form a bluish-grey verrucose lesion, up to the size of a shilling, which may be surrounded by a reddish zone, and it may include several tiny abscesses; a scar may be formed in the middle of the lesion (Rasch). There may be small fistulas.

The infection is acquired particularly during the performance of meat inspection, and it makes its appearance some weeks after the infectious material has been introduced accidentally into the skin of the fingers, a cut with an infected knife, a scratch from a sharp-pointed bone (and often in spite of cleaning and disinfection of the wounds). The lesion is acquired not infrequently by veterinary students during their instruction in meat inspection, as they naturally have not at that time a sufficient training in handling the knife properly and safely. Autopsy on tuberculous animals is another important factor in the occurrence of this lesion (cuts, scratches). Only in 3 cases, on the other hand, was skin tuberculosis reported as originating from removal of a tuberculous after-birth, and in one case from delivery of a cow in whose placenta tubercle bacilli were demonstrated.

The lesion is localized nearly always to the fingers, especially the knuckles; it was situated on the hands only in 5 cases, on the arms in 2. The finger most often involved was the index finger (especially the left), then the thumb and the third finger. Only in exceptional cases were 2 or 3 fingers involved.

As a rule the lesion may be designated as benign under suitable treatment; but metastases and relapses occur. In one case it necessitated amputation of the finger.

Treatment. Most of these veterinarians have been treated with the Finsen carbon-light therapy—with good result. But the treatment has often been protracted, extending even over several months. Eight veterinarians have preferred a more radical operative treatment—a measure which perhaps ought be taken into consideration more often. Eight others have obtained a good result within a few weeks by employment of the method suggested by Dr. J. J. Jensen*, painting with strong Lugol solution (1 + 3 + 4), while this treatment failed in one case. Also energetic painting with tincture of iodine has given a good result in a few cases. In addition, it is to be mentioned that various corrosive remedies have proved effective in a few cases: phenol, silver nitrate, zinc chloride (2 + 1). Also X-rays, cauterization, freezing and phenol-mercury plaster have given good results in a few cases.

One veterinarian, who has had skin tuberculosis twice, says: "First time treated with Finsen carbon arc-light: troublesome, painful and expensive. Second time treated with radium: easy, painless and inexpensive."

* Medlemsblad for Den danske Dyrlægeforening, 1930, p. 122.

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7. **Skin Anthrax (Anthrax Carbuncle, Malignant Pustule).** Anthrax does not belong to the frequent occupational diseases in veterinarians, yet it is reported in 20 cases* in the present material, including one doubtful case. In one case the throat was involved, and in one case the disease was generalized; in all the other cases it was a cutaneous lesion.

Even though this form of the infection is fatal but seldom (one fatal case in a veterinary surgeon is known to me), the disease is very serious, and often it takes a long time to heal. So an early diagnosis is very important to the treatment. As to the diagnosis, it will be appropriate to cite the description given by Rasch: " Within from one to three days after the infection there appears a little red nodule, reminding of an insect bite, which is soon covered by a vesicle, from hemp-seed to pea size, containing serous or bloody fluid and resting on a hard infiltration of the deep layer of the skin. Within a few days the centre of the vesicle is replaced by a small brown or black scab (from this the French name of the disease: *charbon*), surrounded by a wall of firm red oedema, on which is seen a ring of vesicles, or just a few. Gradually the first ring of vesicles turn into the central necrosis, and new vesicles are formed outside. The hard infiltration extends rapidly in the deep layers, and a firm cyanotic oedema may occupy the entire extremity. At the same time there is oedema and swelling of the regional lymph glands."

Cutaneous anthrax in veterinary surgeons appears nearly always within 4—8 days after autopsy on cattle that died of anthrax. Most often the lesion is located on the forearm or wrist. *It is to be pointed out that the anthrax bacilli often make their way through the unbroken skin* (observation made by several veterinarians), *and that they may withstand even disinfection with lysol and sublimate + thorough washing after the autopsy.*

The disease really takes an acute course, but the deep and extensive process will often cause the healing of the wound to be very protracted (up to 4 months).

The *treatment* consists in hot compresses, changed at short intervals. Some authors recommend application of iodine and dry bandaging; later, ordinary wound dressing with ointments and cotton bandage.

Anti-anthrax serum (2 + 20 c.c., intramuscularly) has a specific effect. On account of the risk of " serum disease," however, several authors prefer the likewise specific neosalvarsan treatment: as early as possible, intravenous injection of 0,75—0,90 g. neosalvarsan (Rasch).

8. **Undulant Fever (Bang).** As to the occurrence of undulant fever as an occupational disease among veterinary surgeons, it may be appropriate here to mention that I have made this question the subject of special studies as reported in two communications from the Danish State Veterinary Laboratory.† These

* Isolated cases are reported in Maanedskrift for Dyrlæger, vol. 24, 37, 38 and 47.
† Maanedskrift for Dyrlæger, 43: 46, 1931–32 and 48: 161, 1936–37.

Fig. 5. LONG RUBBER GLOVE, PARTICULARLY SERVICEABLE IN REMOVAL OF PLACENTA, RECTAL EXPLORATION AND OBSTETRICAL AID IN STOCKS WITH INFECTIOUS ABORTION. (This glove, also the next, may be obtained from Simonsen and Weel, Copenhagen).

Fig. 6. SHORT STRONG RUBBER GLOVE, VERY SUITABLE FOR AUTOPSY AND SIMILAR EXAMINATIONS.

ARTICLE BY AXEL THOMSEN.
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studies show that in the 5-year period of 1931—35 altogether 17 cases of undulant fever occurred among veterinarians (6 of whom were senior students). In most of these cases it was a serious attack, with protracted clinical phenomena.

Quite a different condition is found in the *latent* symptom-free infection which most veterinary surgeons go through without having the slightest idea about it. In a previous paper* (1930) I have demonstrated that more than 94% of the examined veterinarians who had been practising in the country for more than one year gave a serological reaction indicative of such a symptom-free infection with abortus bacilli (Bang) that appears to leave a lasting immunity.

The clinical cases are encountered only among the young veterinarians including the older students, appearing as a rule even within a few months after they have commenced practising in the country. Older veterinarians, as mentioned may be regarded as being immune—an assumption that finds a very strong support in the fact that specific antibodies may be demonstrated directly in their blood.

Veterinarians who in future intend to practise in the country are advised before they leave the veterinary college to be vaccinated with abortus vaccine (State Serum Institute). Of course, the veterinary students are advised to be most cautious and careful in all their practical exercises at college that may involve any risk of infection, and they are advised in the vacations to refrain from removal of placentæ and other obstetrical work for practical training if the stock in question is not free from this infection.

9. **Equine Stomatitis. Pustulosa contagiosa equorum).** Probably not all veterinarians are acquainted with the fact that man may be affected with equine stomatitis—but it is a fact which I have experienced myself. Also Hutyra and Marek point out that the infection may take in man. In the present material, however, only 9 veterinarians report they have been infected with this disease. Etiologically the disease is closely related to cowpox, and it takes an acute and benign course (with fever). It manifests itself partly by an eruption of small blebs in the mouth, partly by pustular dermatitis of the hands and face. Naturally, infected persons may transmit the infection to horses.

10. **Cowpox.** Strikingly few cases are reported in which cowpox is transmitted to veterinarians. In the present material only 5 veterinarians have reported this affection (on the fingers); but it is said to be rather frequent among milkers. Thus it seems to be of no great importance as an occupational disease among veterinarians.

11. **Foot-and-Mouth Disease.** Even though it has been greatly disputed whether man may be attacked by the virus of the foot-and-mouth disease, there seems no longer to be any doubt on this point.†

* Den kgl. Veterinær- og Landbohojskoles Aarsskrift 1930, p. 179.
† See, for instance, Trautwein: Arbeiten aus den Staatlichen Forschungsanstalten Insel Riems, 1932.

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It does not play any rôle as an occupational disease, as in the material only 4 veterinarians have reported they have had the infection. It takes an acute benign course with fever and an outbreak of blebs in the mouth, on the lips, between the fingers and around the nails (on the toes as well as fingers). The more important feature of this infection in veterinarians is that it may again be transmitted to cattle.

12. **Other Infections.** *Panaritium* is reported in 5 cases, acquired under various veterinary operations.

Conjunctivitis is reported in 3 cases; in two it was acquired in the performance of milk control (the cows switching their tails) and in one from a vaginal injection.

Two veterinarians state they have had abscesses in their face after contact with pus from punctured *strangle abscesses.*

Finally, one veterinarian reports that he has been infected with the virus of *chicken-pox* while taking samples of blood from fowls, and another has reported *malignant oedema* acquired from a horse. The latter infection took a malignant course and, the report says, " before the disease had passed, the infection was transmitted through obstetrical work to a cow and a sow, which both died."

Allergic Conditions

13. **Brucella Skin Eruption.** As is well known, this skin eruption is not an infection with abortus bacillus, but rather an allergic reaction, an allergic skin lesion produced by the proteins of the abortus bacillus upon a skin which, as a rule, has been sensitized through a latent infection with abortus bacilli. A strong support of this view is found in the fact that the skin eruption may be produced experimentally by inunction of abortin (prepared like tuberculin) on the skin of susceptible persons.

This phenomenon appears on the forearm of the veterinarian as an eruption of more or less close-packed follicular papules, with formation of pustules and necrosis. It appears in immediate connection with manual removal of the afterbirth or other obstetrical work on cows infected with infectious abortion, and it breaks out as early as from 3 to 12 hours after exposure. The eruption has a marked tendency to a fairly rapid spontaneous recovery—in from 8 days to 3 weeks—but it recurs on every exposure to this specific agent, Fig. 3.

The affection is one of the most annoying troubles associated with the work of a veterinary practitioner. In the present material no less than 171 veterinarians have recorded its occurrence, but probably the diagnosis has been mistaken in a rather large number of cases, at least 40—something that will be dealt with later on.

Occasionally the eruption is so severe as to incapacitate the patient for work, at any rate partially, and in a few cases its character has been so severe that the

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veterinary surgeon had to give up his practice on that account. Not infrequently it is recorded that the affection is accompanied by malaise (fever).

Brucella skin eruption has been described in detail in " Maanedskrift for Dyrlæger,"* so it will suffice here merely to mention the treatment. Just, in passing, a few remarks on the occurrence of the affection. On going through the 171 cases in which Brucella skin eruption has been reported, some bright points are found in all the gloom. For it is found that the affection appears but very seldom from the point of time when the veterinarian commences practising till he quits practice. Sometimes the eruption may come in the first years of his practice, but often a good many years go by before it makes its appearance, and in both cases it usually subsides after it has prevailed through a number of years.

Treatment. Prevention is by far the most important thing, as the skin eruption generally disappears in from 8 days to 3 weeks if no new exposure takes place in the meantime.

Many veterinarians have reported that an effective preventive measure is obtained in thorough inunction of the arms with various fats *prior* to the removal of the afterbirth, etc. The following fatty substances have been mentioned as useful in this respect: pure lard, camphor ointment, camphor oil, rape-seed oil, lanolin, thick motor oil, vaseline or paraffin. In addition to this, it is advisable *after* the operation to wash the arms thoroughly in several basins of *cold* water prior to the real washing with soap and warm water. After the soap-washing it is recommended to wash the arms with alcohol of greatly diluted Lugol solution (1 tablespoonful to ½ bucket of water) and finally rub the skin with lemon cream. Instead of washing with Lugol solution some veterinarians prefer application of tincture of iodine + glycerin, equal parts.

Several veterinarians recommend inunction of the arm with 1% desol oil prior to the removal of the placenta, and washing with liquid desol soap after the work is over.

In cases with severe eruptions the oily inunctions are inadequate, and it is necessary to use such special gloves as will be mentioned later.

As to the treatment of the eruption itself, it is to be mentioned that many veterinarians recommend first to paint with iodine, which gives at once a great relief by abolishing the itch. The same is said to hold good of 10% salicylic alcohol. Among other recommended remedies, I may mention: zinc oxide paste, decoct of oak bark with glycerin, ichthyol ointment, anesthesin-zinc ointment. Also light therapy (mercury-quartz vapour) has been suggested as a combination of curative and preventive therapy.

14. **Other Allergic Conditions.** In connection with the Brucella skin eruption I wish to mention a group of morbid phenomena that probably form

* Haxthausen and Axel Thomsen, Maanedskrift for Dyrlæger, 42: 609, 1930–31.

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a nosographic unit, the clinical features of which have been roughly sketched in the foreign literature*, while it seems not to have been described in the Scandinavian literature. It concerns *another erythematous eruption on the arms and hands of veterinary surgeons.* It appears by no means to be a rare phenomenon. As I now look upon this condition, it is an allergic reaction, like the Brucella skin eruption, but produced by the action of heterogenous proteins from the cow (and sow) upon the macerated skin. But I have to admit, only a few veterinarians —perhaps a dozen—have adopted this view. Still, there can be no doubt that a great many of the aforementioned cases with a questionable Brucella skin eruption properly belong to this group, presumably this applies also to some of the " sure " cases of Brucella skin eruption—but, of course, it is impossible to say how many. Additional cases may be found in the group of skin lesions, comprising 28 cases, that are recorded in the questionaries under the headings " special conditions " (often designated here as " eczema ") and " hypersensitiveness." For that matter, it is reasonable to assume that the same veterinarian may at some time be attacked by the Brucella skin eruption and at other times by the lesion under discussion now; furthermore, a concurrent appearance of the two lesions is conceivable too, blurring their typical features.

At present I am unable to give any complete presentation of this eruption. Thus I cannot see whether the eruption arising after treatment of a cow differs from that which appears after the treatment of a sow, or whether the disinfectants commonly employed or frequent soap washing may constitute a contributory, perhaps aggravating, factor. Still, I am able to state that *in the great majority of cases the eruption appears only in the busy springtime,* especially in connection with *rectal exploration, removal of afterbirth* and *protracted delivery* in cows, independent of the presence or absence of infectious abortion in the stock. It is to be pointed out that the mere contact with fresh amniotic fluid alone can produce the lesion. Furthermore, in some veterinarians the eruption appears especially after *protracted delivery of a sow,*† and in a few cases after exploration of a mare.

It seems convenient for the present to designate this lesion as " *spring eruption* " because of its conspicuously frequent occurrence in the springtime when so many animals have young ones. Sometimes it develops very rapidly, and some veterinarians report that they felt a peculiar burning or itching of the skin even while they still were occupied with the work that provoked the outbreak. The eruption sets in as a markedly diffuse redness and swelling of the skin of the arm (most often the right) which then becomes studded with close-packed " knobs "—resembling the vesicles produced by the stinging nettle—without subsequent pustule formation. The affection is tender on palpation and itching intensely, sometimes a little moist. Exceptionally in the more severe cases, which

* Huddleson and Johnson, Journ. Am. Med. Ass., 94: 1905, 1930. Riedmuller and Stihl, Schweizer Arch. f. Tierheilk, 73: 588, 1931. Wilson, The Veterinary Record, N.S., 12: 1,240, 1932.

† Two Veterinary Surgeons have reported a similar eruption from inspection of hogs in a big slaughter house.

may be exceedingly annoying or even malignant, there may gradually be sores with crust formation, scabs and scaling, Fig. 4. As a rule, however, the eruption subsides very rapidly, in from a few hours to 2—3 days. In other cases, especially if the arm is exposed to the provoking agency continually, the healing proceeds very slowly, and yet spontaneous recovery as a rule results within 14 days if new exposure is avoided. In a few cases the eruption is scattered all over the body.

As to the prevention of this lesion, the principles are the same as for prevention of Brucella skin eruption, namely: complete inunctions (vaseline) or, in severe cases, long rubber gloves. Light and X-ray treatment has been recommended for curative and preventive therapy. For the itch it is recommended to use arnisan-glycerin, and glycerin ointment with tartaric acid (100+2).

As to other allergic conditions I shall merely mention that 7 veterinarians have reported hypersensitiveness for horse hair and horse scales, 1 for cow hair, and 4 for chicken feathers (asthma).

Accidental Tuberculin Reaction. A special form of allergic reactions connected with veterinary medicine is encountered occasionally when the veterinarian during his examination of a stock with tuberculin tests accidentally sticks himself with the tuberculin needle, in a finger, or, more infrequently, in the hand. The accident may occur when he is dealing with violent animals, or when an otherwise docile animal suddenly makes an unexpected movement. Seven veterinarians have recorded accidental tuberculin reactions of this kind. The character of the reaction will largely depend upon the amount of tuberculin injected, the site of injection and the depth of the injection, besides the individual sensitiveness. There may be a violent local reaction with skin necrosis (2 cases) as well as a general reaction with marked rise of temperature (up to 41.2° has been recorded in my material)*.

Idiosyncrasies

Individual predisposition or idiosyncrasy in veterinarians, especially skin affections produced by pharmacological preparations (artificial dermatitis), will here be dealt with quite summarily, partly because the veterinarians themselves in most instances have failed to give particular details, partly because these conditions are found to play only a minor rôle. On the whole it may be said that the substances which have not been tolerated by these veterinarians could readily be replaced with others, and it is only in exceptional cases that the noxious substance (formaldehyde) appears to have produced any chronic lesion.

1. *Formaldehyde.* 63 veterinarians have not been able to tolerate the employment of formalin or sapoformol. As a rule these substances produced an intensely itching eczema between the fingers and on the hands (dorsum). Sometimes the

* In Svensk Veterinärtidskrift Vol. 42, p. 117 and 148, 1937 similar cases are reported.

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lesion has become chronic, but in such cases X-ray treatment has given an almost miraculous effect.

2. *Phenol preparations* form the next largest group of such conditions: 30 veterinarians have reported hypersensitiveness to *lysol*, 22 to *phenol*, and 9 to *creolin*. As a rule the lesion consists in an itching vesicular eruption, "eczema."

3. *Iodine*. 13 veterinarians have reported that they have sensitive to iodine: erythematous and vesicular dermatitis.

4. *Iodoform*. 12 cases of erythematous-vesicular dermatitis.

5. *Arsenic* (cattle-wash). 6 cases, partly local effect, partly universal (2 veterinarians report oedema of the eyelids).

6. *Sublimate*: 6 cases, chronic dermatitis.

7. *Chloramin*: 4 cases, "eczema."

8. *Aloes* (powder): 4 cases, vomiting and diarrhœa.

9. *Mercury*. 3 cases, "eczema."

10. *Rivanol*. 3 cases, "eczema."

No other pharmacological preparations employed in veterinary medicine appear to have had any conspicuous noxious effect upon veterinarians in their employment of the remedies.

Comments and Conclusions.

In order to facilitate inferences from the material here presented, I have tabulated it as follows:

Survey of the Occurrence of the More Important Occupational Diseases in Veterinary Surgeons.

Ringworm	159	veterinarians
Mange (sarcoptes)	10	,,
Erysipelas	43	,,
Furunculosis	133	,,
Carbuncles	11	,,
Oedema with lymphangitis and abscess formation	200	,,
Abscess without lymphangitis	72	,,
Oedema without lymphangitis	10	,,
Oedema × abscess without lymphangitis	9	,,
Skin tuberculosis	72	,,
Anthrax, cutaneous	20	,,
Undulant fever (1931—35 inclus.)	17	,,
Foot-and-mouth disease	4	,,
Equine stomatitis	9	,,
Brucella skin eruption (including 40 doubtful cases)	171	,,
"Spring eruption"	?	,,
Accidental tuberculin reaction	7	,,
Idiosyncrasies	175	,,

From this survey it is quite evident that occupational diseases play a very great rôle in the veterinarian profession here in Denmark, even though several perhaps many, cases undoubtedly have not been recorded because they were forgotten in the course of time. Everybody will agree that an improvement of these conditions is highly desirable. Such an improvement may be accomplised in various ways; I shall outline the main principles.

Above all, it is essential that the veterinary surgeon realises that in the performance of his work he daily meets the "grim harvester". This meeting ought not to be traditionally congenial but as distant as possible. He further must keep in mind that now there can be no doubt that several pathogenic bacteria (anthrax bacilli, abortus bacilli, etc.) may invade the skin (by way of the hair follicles) even though there is no break in the continuity of the skin. But, of course, open wounds involve a far greater risk.

From the reports received from the veterinarians it is evident that infection—especially those forms that are acquired in obstetrical work, and also the Brucella skin eruption—often may be avoided simply by *thorough application of fat or vaseline to the hands and arms* before the work is commenced and thorough washing in several basins of water, followed by disinfection, after completion of the work.

But these precautions are not sufficient for particularly susceptible persons, who positively ought to use *long rubber gloves*, for example, as shown in Fig. 5.

From the veterinarians' reports it may be taken as established, too, that various infections are often acquired at the autopsies, notwithstanding ordinary washing and disinfection (erysipelas, tuberculosis, anthrax, lymphangitis, etc.). *Therefore the veterinarians ought to make it an indispensable rule not to perform any autopsy without rubber gloves.* For this work it will be preferable to use a shorter and more convenient glove, as shown in Fig. 6.

In case of emergency, the minimum requirement of precaution in performing an autopsy must be inunction of fat together with thorough disinfection.

Another important matter is the *wound hygiene*, in other words, what the veterinary surgeon has to do if he cuts himself or gets a scratch while working with infected material (in autopsies, meat inspection, operations, obstetrical aid, etc.).

I have discussed this question with Professor Dahl-Iversen (Surgery), University of Copenhagen, and I regret to say that this question cannot at present be answered satisfactorily. In the modern treatment of wounds in human surgery no disinfectant is applied to the wound itself (only its surroundings are disinfected). It is claimed that the benefit derived from a possible destruction of bacteria in the wound by means of disinfectants is lost through the impairment of and damage to the tissues which unavoidably accompany the use of disinfectants.

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The general rule is to excise the wound if possible or trim it, wash with physiological salt solution (possibly with hydrogen peroxide in order to obtain a strong mechanic cleansing effect), and suture or drain it, depending upon the conditions present.

As to the wounds acquired by veterinarians during their work, it goes without saying that, as a rule, they imply a far more dangerous infection than do similar wounds under ordinary conditions. Here, only one safe way may be pointed out: cauterization with a Paquelin burner as soon as possible or, better yet, by diathermy. While excision is in itself an excellent measure, it will not usually be practical in these cases. Naturally, however, there will be numerous occasions of this kind where the veterinary surgeon takes the acquired lesion to be less risky and refrains from cauterization of the wound even though the possibility of erysipelas, tuberculosis, pyogenic infection, etc., cannot be ruled out. For the present, one would hardly in such cases advise against immediate and energetic application of iodine to the wounds, but it has to be realised that this treatment offers no guarantee whatever. Further investigation of this important question seems desirable.

Finally, there is the *disinfection of the skin in general*—that is, the question as to how one is to disinfect his hands and arms after working without gloves in an infected field. This question has two aspects: the aim of this disinfection is not only to protect the veterinarian himself against infections, but also to prevent transmission of the infection from one animal to another.

This is really an important and comprehensive problem, deserving the greatest attention and also further investigation and practical elucidation. Here, however, I will have to limit myself to refer to a few examples of skin disinfection, mentioning first two methods employed in the Royal Veterinary College.

In the Department of Pathological Anatomy, according to Möller-Sörensen*, the following method is employed after conclusion of the autopsy: (1) Washing with soap and running hot water. (2) Washing in warm formorol solution. (3) Washing in weak tincture of iodine. In spite of this measure, Möller-Sörensen contracted anthrax himself after an autopsy.

In the Ambulatory Clinic the following method is adopted in removal of the afterbirth and in obstetrical aid: Wash the vulva of the cow and surrounding region with soap, then wash with alcohol. Wash arms and hands (not forgetting the nails) with soap, then wash with alcohol; dry in a clean towel; apply a layer of vaseline all over. After completion of the work wash first with warm water and soap; take off the rubber coat; wash again with soap and warm water; rinse in ½% coronal solution; dry arms and hands in clean towel, then wash with alcohol and let dry in the air. In the evening, apply glycerin ointment (Parmacopea Danica, 1907) to hands and arms as a skin tonic.

* Maanedskrift for Dyrlæger, 37: 205, 1925—26.

In order to throw some light on the question of skin disinfection from the point of medicine, I have discussed it with Professor Haxthausen (Dermatology), University of Copenhagen. On the basis of modern points of view he claims that as far as the individual person is concerned, disinfectants often give more harm than benefit as they gradually attenuate the natural resistance of the skin, and this drawback increases with the energy of their application. This is substantiated by experiences from the autopsy rooms. Under special conditions it is recommended to use ½% sublimate alcohol, but only to the extent the skin will tolerate. The primary aim should be to strengthen the skin through its proper care, with employment of a good neutral soap, gentle washing, and frequent application of a suitable fatty substance as, for example, water-free lanolin g. 40 + peanut oil g. 10.

Even though disinfection of the unbroken skin in general appears to be discarded by the physicians, this modern viewpoint cannot be adopted by the veterinarians, as *we have to consider also the transmission of the infection from one animal to another—from one stock to another—a factor of great practical importance.*

Naturally the problem would be solved if veterinarians could always work with their gloves on. Probably this is impossible, but it should be aimed at as far as possible—a point that is quite obvious from what has been said in the preceding.

Of course, it is not necessary here to emphasise the necessity of thorough washing of the hands after any contact with a sick animal.

My previous studies on the occurrence of undulant fever and Brucella skin eruption in veterinarians aroused my interest in veterinarian occupational diseases in general, resulting for the present in the survey given here of this field.

As the material essentially falls in the realm of human pathology, it is hardly to be expected that my presentation of it might be free from errors and shortcomings. It is my hope, therefore, that some other student, with special training in human pathology, will later take it up for a more thorough analysis and elaboration.

As it is, I think, my work invites to an investigation into the social and organisatory aspects of the problem. From the reports received, it is evident that the veterinarian occupational diseases, especially the skin eruptions, are apt to be so troublesome that the practitioner sometimes has to give up his practice on that account. It would seem reasonable, then, if the national association of veterinarians would take up the problem of occupational diseases as a social question to be dealt with.

In conclusion, I wish to thank Professor M. Christiansen, Director of the State Veterinary Serum Laboratory, because he allowed this work, which concerns infections of domestic animals, to be made an ordinary part of the investigations carried out by the laboratory; otherwise it would not have been carried through.

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DRUG-INDUCED STERILITY OF FEMALE FILARIAL WORMS

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A CONCLUSION come to by Sir Patrick Manson, regarding the cause of the ebb and flow of the tide of *Microfilaria bancrofti* in the skin blood, was accepted without question for many years; it was that, when periodicity was present in an infection by *Wuchereria bancrofti*, this tide was due to migrations of the larvæ, its fall being caused by their hiding themselves by day somewhere in the depths of the human body, its rise by their coming out at night into the blood circulating in the skin; this belief implied that microfilariæ were not ephemeral creatures, but that, roughly speaking, the same ones kept reappearing in the skin capillaries night after night. Nine years ago I reasoned (Lane, 1929), that this could not be the explanation of this periodicity but that, as indeed Myers had held in Manson's early days, when this infection was periodic the rise of the microfilarial blood tide was reasonably explained by a simultaneously timed parturition of female worms, the result of some stimulus then (and still) unknown; it followed that the fall of the tide must be due to their destruction on a scale as massive and rapid as that of their birth, for if microfilariæ were merely rapidly removed from the circulation daily pending slow destruction, they would accumulate somewhere in numbers large enough to defy concealment. The structure concerned in this destruction was probably the reticulo-endothelial tissue through its mobile cells (Lane, 1937), seeing that these are specially concerned in bodily defence against such animal parasites as protozoa, and in addition are visibly concerned, notably as giant cells, in the destruction of *mf. bancrofti* while it is making its way to the great veins along the lymph passages in which it is born.

The suggestion that simultaneous parturition by female worms was the cause of the rise of the microfilarial tide in this periodic infection appealed to Professor F. W. O'Connor as something he could test. He did so extensively before his untimely death; he found that all female worms recovered living from the same host at the same hour had their intrauterine young equally developed, that the extent of the development varied with the hour, and that somewhere in the early afternoon the uteri of all worms emptied themselves under some common stimulus and discharged microfilariæ simultaneously into the lymph stream; its slow and damned up current carried them into the blood in greatest numbers about midnight. The fact that these empty worms were spent worms, spent simultaneously for the day, is an important part of the evidence that the rise of the microfilarial tide is due to simultaneous parturition by female worms.

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On the matter of microfilarial destruction, O'Connor found that in three of the four cases in which he sectioned liver and spleen extensively, such destruction was taking place in them on a great scale, and the fact that in the fourth the larvæ looked normal does not weaken conclusions; for it falls in with the consideration that, if the daily fall of the microfilarial blood tide is caused by rapid destruction of microfilariæ such destruction will presumably show a periodicity comparable to that of the periodic parturition which frees them from the mother worm, and that newborn microfilariæ will show, even in the organs which finally destroy them, no clear sign of degeneration. Evidence of microfilarial destruction has not yet been looked for in the marrow, the third great bodily reservoir of reticulo-endothelial tissue. It is the case, then, that O'Connor's histological evidence uniformly corroborates my reasoning of 1929 that the rise of the periodic microfilarial blood tide in this infection is due to synchronised parturition by mother worms, and points to the reticulo-endothelial tissue as the essential cause of its fall.

Such rapid wholesale destruction of the massive microfilarial brood expelled by the mother worm involves a radical change of outlook on medical and veterinary pathology in two directions. First there may be hypertrophy of those cells which are called on for extra work; for example before these microfilariæ get into the blood there is an increase of the mobile cells of the reticulo-endothelial system along that lymph tract through which the larvæ pass, and the end phase of that cell series is the fibroblast and the fibrous tissue it forms, a consideration which explains such bodily changes as elephantiasis. Second, there may be blockage, physiological blockage, of the system, the condition in which it is so overwhelmed by a special call that it can no longer carry out even its usual defensive duties; the special call in this case is to destroy this great and repeatedly arriving mass of microfilariæ; if their birth could be stopped this strain on the host would go. Their birth would cease on procuring the death, or the sterility, of the mother worms by some drug more poisonous to them than to their host. The former effect would certainly be the better, for O'Connor's sections clearly show that adult worms harm the host in more ways than one, but if to sterilise is easier and safer than to kill worms, and if the above considerations are sound, the second best is no bad second.

The work of O. K. Khaw and S. H. Cheu (1936), shows both effects in action; they used, by intramuscular injection, some organic antimony compounds in the treatment of dogs infected with *Dirofilaria immitis*, but the doses needed to kill or sterilise the parasites are close to those that kill the host, so that when used for treament regard to detail is particularly essential. There were indeed symptoms of poisoning in all their dogs, when this was acute there were vomiting, diarrhœa, fever, prostration, and bronchitis passing into lobular pneumonia; when poisoning ended in death the liver, spleen and kidneys were fatty. Some details of the effects of treatment are these.

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Concentrated fouadin was given daily to 10 dogs till microfilariæ disappeared from the blood; this took three to five days; six of the dogs died, five of them in five to thirty days after a dosage of 0.38 to 0.65 c.c.m. per kgm., one of them after 107 days having had 0.26 c.c.m. per kgm. Of the four that lived there was reappearance of larvæ in three after 11, 11 and 126 days, the dosage having been 0.37, 0.27 and 0.27 c.c.m. respectively. In the fourth which had a dosage of 0.42 c.c.m. there was no reappearance. All the dogs which died or were killed after treatment had living female worms in the right heart; in those whose blood contained no microfilariæ at their death, the uteri of these worms were empty, and among them was one of the dogs in which microfilariæ had reappeared after 11 days and had been disposed of by a second treatment course; in the two dogs in which microfilariæ had reappeared and remained in the blood, the uteri contained larvæ. In addition to this sterilisation, some worms had been killed, had been swept off as emboli into the lungs, and had there caused infection, but they, too, had first been sterilised.

Concentrated fouadin was given on alternate days to six dogs in initial doses of 0.45 to 1 c.c.m. rising to 0.9 and 2.0 c.c.m. All these dogs survived treatment, improved physically and ceased to have microfilariæ in the blood after 11 to 14 days, though to secure this the drug had to be given at the end of the course on two consecutive days, and its total amount lay between 0.58 and 0.71 c.c.m. per kgm.; they were killed after 27 to 221 days, all then had living worms in their hearts, all these worms were sterile and there were dead worms and infarcts in the lungs.*

The evidence, then, is that concentrated fouadin given in such doses on alternate days had been of marked benefit to the bodily condition of these dogs and had killed none, though clearly the lethal dose was not far off. The effect of the drug on the female worms had been the sterilisation of all and the killing of some, and the sterilisation in this particular series persisted over the 221 days during which the dog lived. The reasonable conclusion is that it was when the reticulo-endothelial system ceased to be overtaxed in its struggle against microfilariæ that the dogs improvement in health set in. For the benefit of man and dog it is clear that the work of Khaw and Cheu needs the confirmation of repetition.

On the general question of the cause of microfilarial periodicities, Dirofilaria infection in the dog should be able to shed light, if due allowance is made for the special bood conditions found in this infection. For example in Wuchereria infection the ebb of the microfilarial blood tide is nearly complete, a good example being that reported by Warrington Yorke and Blacklock (1917) in which the numbers in 1 c.c.m. of blood were 12,850 to 50 or 257 to 1; in a like instance reported by Khaw and Cheu they were 16,000 to 2,600 or about 6 to 1. The periodicity in the two infections is of quite different type, and it follows that if the reticulo-endothelial system of the dog is not blocked by this overwork, and if

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larvæ are being destroyed rapidly as soon as born, the difference may be accounted for by a timing of parturition which is not completely simultaneous. That means that if these worms empty their uteri and become spent when parturition takes place, it will be possible to trace a correlation between spent worms and the microfilarial blood tide. In other words, so far as it is possible to be sure that these worms live only in the right heart, the charts of the microfilarial blood tide from specimens taken, say, two-hourly, in a series of dogs could be correlated with the number of empty worms found in their hearts when they have been killed at different hours. That these empty worms occur is known, but no attempt has been made to determine whether here, as in Wuchereria infection, they may reasonably be looked on as spent worms. That is the crux of this problem with its marked importance for man and beast.

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TRANSIT FEVER.

By Miss E. A. R. BURNETT, M.R.C.V.S.

Calderbridge, Cumberland.

THIS condition is probably so well known to all practitioners that an article on the subject may seem redundant; nevertheless in my district at this time of year it looms so large, and the literature on the subject is non-existent in the standard textbooks, that I am constrained to state my experience of the condition more in the hope of acquiring knowledge from the more experienced than in the hope that my observations are in any way new or original.

In West Cumberland, as in many other districts, large numbers of Irish cattle are bought in to fatten and it is on these animals that I have made my observations, which extend over several years. The incidence of the condition varies from year to year and appears in from 3 to 14 days from the time of landing in this country.

Clinically it may be roughly divided into three main types, (*a*) Pulmonary; (*b*) stomach with obstinate paresis of the rumen; (*c*) enteric with persistent diarrhœa, which type is usually fatal.

The subdivisions are by no means absolute as more than one type may appear in the same subject but they serve as a rough classification. One of the most

* Three more dogs were treated with antimosan and died, and three others with neoantimosan were killed; but the details given are too few for the experiments to be of value here.

noteworthy symptoms in the early stages is the very high temperature exhibited, I have on record a case of a heifer with a reading of 108 (checked on a second thermometer). This case ended fatally, but temperatures may remain between 106 and 107 for several days.

I have seen no evidence of the condition being infective from animal to animal and have therefore come to the conclusion that any bacterial invasion is secondary, following a general lowering of resistance to disease through the strain of travel conditions, such as sea sickness, excessive heat on board followed by the sudden change of temperature on landing on exposed quays in the winter, long abstinence from food and change of climate.

Some of the cases of stoppage are probably not Transit Fever but indigestion due to dietetic causes, but it is often difficult to draw a hard and fast line as many of these cases show excessive temperatures.

Prognosis except in type (*c*) is usually favourable provided that the general condition of the patient is fairly good, many of the cattle are very poor and in no state to stand any illness.

Treatment is entirely symptomatic and, referring to Irish cattle, one of the greatest difficulties is to persuade the patients to eat, as many of them are unused to indoor feeding.

I have tried various preparations and have found that in the early stages injections of Omnadin exert a favourable influence.

In the stoppage type I have lately been using Messrs. Kommers Lentin combined with the usual tonics but have not as yet a sufficient number of cases on record to form a definite opinion.

In the type accompanied by diarrhœa I have been using Messrs. Bayers Carbo-Pulbit in massive doses but in this type subnormal temperatures and prostration followed by death are all too frequent.

In all except the very slight cases great depression exists, followed by a protracted convalescence.

Clinical Articles

A CASE OF BOWEL RESECTION IN THE DOG

By H. O. M. SHEPPARD, M.R.C.V.S.

*R.S.P.C.A. Free Clinic, Putney, S.W.*15

Subject: 5 months spaniel—male.

History: The dog was first presented at the R.S.P.C.A. clinic at Willesden and was examined by Miss Izzard, M.R.C.V.S.—the case card reading temperature 102.5, diarrhœa, inappetance, vomiting, and a prolapsed rectum. The bowel was returned and suitable medicine was prescribed, and a diagnosis of distemper was made.

The patient was returned in seven days time with no improvement and was now also passing blood and showing streaks of blood in the vomit. During the week the rectum had prolapsed several times and had been returned by the owner. On examination by Miss Izzard on this occasion a definite intussusception was felt and immediate operation was advised.

The dog was sent to our Putney Hospital and I examined it on arrival, confirming Miss Izzard's diagnosis.

From questions put to the owner I estimated that the intussusception had been present for 48 hours, approximately, and a very guarded prognosis was given.

Operation: Anæsthetic. Nembutal *via* the radial vein. The left flank was chosen and clipped and shaved. An incision two inches long was made parallel to and equi-distant between the spine and the linea alba.

The intussusception was drawn out of the abdomen and found to comprise 15 to 18 inches of small intestine, the cæcum being telescoped into the colon. The bowel was manipulated to break down adhesions and reduce the intussusception. This was successful until the cæcum was reached, but owing to the increased bulk of the mesenteric glands which were also involved, the terminal portion of the ileum split through all its layers to within two inches of the ileo-colic valve, and owing to the damaged state of the ileum and the mesentery it was considered necessary to excise 6—8 inches of the ileum.

The mesenteric vessels were ligated and the diseased portion of the bowel excised. The anterior portion was inserted for a distance of 1½ inches into the greatly distended part of the posterior portion. This was anchored by one silk suture, and the resulting overlapping portions were joined by a single row of interrupted silk sutures, omentum was folded round the incision and the whole returned to the abdomen.

The abdominal incision was closed in two layers, catgut being used for the muscle and silk worm gut for the skin. The dog made a complete recovery in 14 days although still showing signs of distemper.

"HOOSE" IN LAMBS!

By J. W. HALL MASHETER, M.R.C.V.S.

Newnham-on-Severn.

THIS affection was in a flock of lambs about eleven months old. Originally the flock numbered 186, but at the time I was called in had dwindled to 150—36 having died.

The owner had dosed these lambs several times with some proprietary mixture, but, continuing to lose them he asked my advice on January 18th.

Most of the lambs were coughing, many being emaciated and two were very weak, showing lung symptoms. These two died a few days later. There was a considerable amount of nasal catarrh in those affected. One lamb having died on the morning of my visit I made a post-mortem examination. The appearances were those of broncho-pneumonia, the lungs were completely hepatized and the

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trachea and bronchi very much inflamed. There was a considerable amount of catarrhal exudate. A considerable number of the long, threadlike white worms " Dictyocaulus filaria " were present in the trachea and bronchi.

Treatment.

Intra-tracheal injection of 1 c.c. of a preparation of Turpentine, Tinct: Opii B.P., Glycerine and Carbolic Acid.

Technique.

As intra-tracheal injections into the small lumen of the trachea of lambs is not universally practised perhaps an account of the " modus operandi " may be of interest.

A 1 c.c. or a 5 c.c. syringe with graduating wheel is used, with a fine needle. The needle point must be kept sharp, and it is well to have several needles ready, as the point has a tendency to turn up, if, as often happens, one misses the tiny space between the rings of the trachea and the needle goes through the cartilage (which it does fairly easily). The point turns up after hitting the cartilage a few times.

As the skin and the interannular space to be penetrated in these small animals is not more than one-sixteenth of an inch, great care is necessary not to penetrate much more than that distance. One can easily tell, with a little practise when one is into the lumen, as there is, even with a sharp needle, a distinct absence of resistance.

The animal is caught and held between the knees of an assistant with the hind-quarters against a wall, hurdle or partition to prevent backing. The assistant also raises the head vertically with one hand, in order to get the trachea in a central position. The least divergence from the vertical causes the trachea to slip into either one or the other of the jugular furrows, and it takes a fair amount of manipulation to find the trachea. With his other hand the assistant holds the wool towards the animal's chin and so exposes the skin. It will be noted that the wool is in " layers " which run around the neck and these layers are easily separated.

With the thumb and first finger of the left hand the operator finds the trachea, holds it in position in the centre of the neck, and having the bony background of the vertebrae behind it it is easily punctured and the injection made.

Results.

In this instance the results were highly satisfactory. Only the two weak lambs succumbed. Up-to-date, March 4th, the lambs have " done " remarkably well. It is rather a " backaching " job doing 150. It took three hours to get through them, but it was, from the owner's point of view, " well worth it," and it will probably teach him the lesson that early treatment obviates severe losses.

I was rather afraid that the small dose given would necessitate a second injection, but my fears were groundless. I think that 1 c.c. should not be exceeded. Even in the case of " strong " calves I never exceed 1 drachm, as I consider that dose is sufficient to kill the parasites—a larger dose may kill the patient by bringing on a fatal pneumonia.

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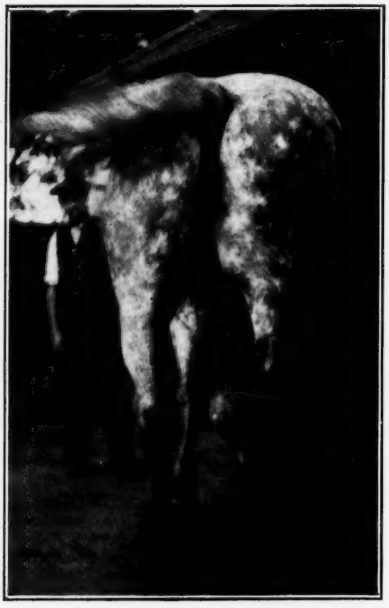

FIG. I

FIG. II

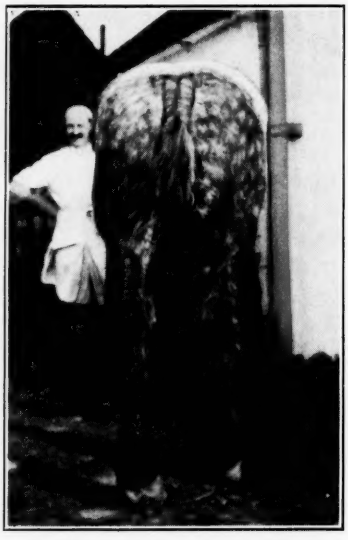

FIG. III

ARTICLE BY DAVID ERIC WILKINSON AND MAURICE KIRK. PAGE 165.

A LARGE THOROUGHPIN

By DAVID ERIC WILKINSON and
MAURICE KIRK, M.R.C.V.S., Chigwell

THE subject, a young Percheron mare, first came under treatment in February, 1937, with the history that the thoroughpin had been in existence for about twelve months.

Treatment consisted of aspiration of the bursal enlargement and injection of the sac with Dean's solution, followed by the application of plaster charges at intervals of a few weeks. Although a large amount of fluid was drawn off there was no apparent diminution in the size of the enlargement, probably owing to the long-continued distention of the sac, but as the mare was now heavy in foal, treatment was stopped until she had foaled and the foal had been weaned.

On October 8th, 1937, the hock was again aspirated and 52 ounces of straw-coloured serous fluid withdrawn and the sac again injected with Dean's solution. Immediately after the operation the hock was blistered. This operation was repeated on October 25th, 26 ounces of fluid being withdrawn. Dean's solution was again injected and the hock again blistered. Plaster charges have since been applied at monthly intervals and the size of the bursa is now reduced to almost its normal dimensions.

The animal has never been lame and has been in constant work since the beginning of this year. The series of photographs numbered 1, 2 and 3, taken respectively on October 8th, October 25th, 1937, and March 2nd, 1938, well illustrate the progress of the case.

Abstracts

SOME DISEASES OF SHEEP*

By Dr. R. F. MONTGOMERIE, Ph.D., B.Sc., F.R.C.V.S.

The Wellcome Laboratories, Beckenham, Kent.

WHILE I was not unappreciative of the honour which the Committee of the Club did me in asking that I deliver a paper on "Some Diseases of Sheep," I was rather loath to accept when I knew that I had to put my thoughts not only into words, but also into cold print. My subject, as I would wish to deal with it, would come much more easily to me, and at the same time be of greater interest to you, were I permitted to ramble along in a description of the research work of recent years which has done so much to clear up a considerable field. I propose to confine myself to that group of sheep diseases which is characterised by sudden death and to include lamb dysentery within my purview. At the meeting I

*Lecture before the Members of the Farmers' Club, Monday, 4th April, 1938.

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hope to supplement what I write by asides and so help to clarify my meaning and illustrate my points.

I have chosen my subject partly because it allows one to emphasise the progress which veterinary research has undoubtedly made in the years since the close of the Great War. Obviously, I belong to that generation of veterinary workers, but it is in no egotistical spirit that I claim these as particularly fruitful years, and I do hope that my paper will pay proper tribute to the many Empire veterinary surgeons whose brilliant contributions have laid at least the foundations of work which should redound to the credit of the profession. Since I do not propose to make detailed reference to the various scientific papers on which my address is based, it is only proper that I should mention now some of the more outstanding: Gaiger on "Braxy," Dalling on "Lamb Dysentery," McEwen on "Struck," Bennetts on "Infectious Enterotoxæmia in Western Australia," Gill on "Pulpy Kidney Disease in New Zealand," Turner on "Black Disease in Australia," Wilsdon on the types of the germ *B. welchii* found in sheep, and among others the small contributions which, in conjunction with Rowlands, I was able to make while in North Wales.

I deal with braxy first because it stands somewhat apart from the other diseases and because it can be used to illustrate the first great obstacle to be overcome in any attempt to investigate the diseases characterised by sudden death. Braxy had been the subject of many investigations before Gaiger cleared up its ætology. Apart from his brilliance as a worker, his success was founded on a determination to use only perfectly fresh material. He and others after him have appreciated the rapidity with which putrefaction sets in after death in sheep. With death, in some cases just before death, putrefactive bacteria from the stomach and intestines invade the carcase, often outgrowing the germ which kill, to the complete confusion of the bacteriologist who attempts to determine the cause of death. This difficulty had certainly confused and confounded earlier workers. By taking his laboratory into the field so that he could obtain living cases of braxy and kill them for examination when on the point of death, Gaiger laid the foundation of the success of his work. This difficulty of early putrefaction has pursued the path of each investigation I have mentioned, but has, by similar methods, been overcome, and in emphasising it I hope I have illustrated the futility of expecting help from the bacteriologist without affording him suitable opportunity. The term braxy is so often misapplied by tagging it to any sudden death in sheep that I would ask you to accept it as essentially a disease of young sheep occurring in the first winter of life often with the first frosts and generally attacking the hogs in best condition. It is caused by the invasion of the wall of the fourth stomach by the germ *Vibrion septique* which in that site multiplies rapidly, producing its toxin which is very lethal to sheep. This inflammatory patch on the stomach wall is the characteristic lesion of braxy but the presence of much bloodstained peritoneal fluid and putrefactive changes are commonly seen in lambs dead of this disease. While braxy is best known as the cause of much loss in Scotland, it

has a high incidence, particularly throughout our Western Counties, and was for quite a period regarded as the main cause of sudden deaths in lambs in many districts. While more recent work has shown some of these views to be fallacious, braxy remains an important cause of loss and it is fortunate that a good preventive vaccine is available.

The modern braxy vaccine injected just once, about two weeks before loss is expected, does materially reduce deaths. Where uninoculated controls have been kept it has been shown that the average death rate of 10 to 15 per cent, is reduced by vaccination to about 1 per cent.

The next disease condition with which I would deal is that now generally known as pulpy kidney disease of lambs. I use illustrations from work done in North Wales to convey the stages in the investigation, but would have you remember that various other researches into this and allied diseases carried through before, or almost concurrently with our observations, led the way to and made possible the solution of our problems. Many must have experienced the finding of a strong thriving lamb, some six to eight weeks old, dead, on a fine spring morning and have " tagged " it as a case of " wool ball." The belief that wool balls in the fourth stomach caused the convulsive symptoms and early deaths so commonly seen in flocks producing fat lambs was long accepted. A series of post-mortem examinations certainly disclosed the presence of one or more wool balls but, with very rare exceptions, they lay quite free in the stomach doing no damage and it is known that their presence may well be regarded as " normal." There are other post-mortem features of much greater significance. The presence of quite a large quantity of straw-coloured fluid in the heart sac is constant, as also are the hæmorrhages just under the outer and inner covering of the heart muscle. The liver and very often the small intestine shows congestion and the kidney abnormality gives the disease its modern name. If the lamb has just died the kidneys are somewhat swollen and close inspection shows patches of intense congestion, which are obvious on section. When a period, even only one or two hours, has elapsed between death and examination the kidneys are markedly soft and when the capsule is cut one finds a jelly-like mass, dark red in colour, in contrast to the firm well-defined structure of the normal kidney. These appearances suggest bacterial activity, but in a series of cases searched for organisms within an hour of death, the absence of bacteria was the outstanding finding. Until then one had accepted that bacteria caused damage and death either by gross invasion of the animal body or by finding some site wherein they might multiply and produce their toxin to such an extent that, without further invasion, they produced death. Here, however, was a disease obviously bacterial in origin, but with the bacterium absent from the carcase. These negative findings in the face of strong presumptive evidence that a toxin was at work lead to the suggestion that the bacterium found conditions favourable to toxin production in the intestine and that this toxin was being absorbed into the body in lethal amounts. I still remember the enthusiastic delight—a precious feeling—engendered by our first

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demonstration of the presence of a toxic element in the gut of a lamb just dead of pulpy kidney. The content of the small intestine was pressed out into a sterile jar, an equal quantity of sterile saline added and after thorough mixing, a sterile extract prepared by suitable filtration. Here was a liquid quite free from organisms yet very lethal to laboratory animals. Its intravenous injection into rabbits, mice and lambs in quite small quantities produced symptoms and death in a fashion simulating the natural disease. Thus encouraged, one was able to show that this toxic element, absent in lambs dead of other disease or killed for examination, could be demonstrated with considerable regularity in the gut contents of those which had just died of pulpy kidney disease. Step by step, the organism which produced this substance was isolated from the host of others which inhabit the gut, its identity established and an antitoxin prepared. It has, I think, been conclusively proved by several workers that this *B. welchii* of the D type multiplying and producing its toxin in the intestinal contents is the cause of pulpy kidney disease, wool ball or whatever name you may apply to these sudden deaths in forward young lambs.

The investigation of what is commonly called " Strike," followed very similar lines. Those sudden deaths of sheep in good condition, which are common during the weeks in spring when the first growth of grass becomes evident, have a post-mortem picture not unlike that of pulpy-kidney disease. A more intense congestion of the intestine and its associated vessels is, perhaps, the outstanding difference. Here, again, one was able to demonstrate, but with greater difficulty, since putrefaction occurs earlier in the mature sheep, that the carcase was not invaded by bacteria until some short time after death. It has been shown that a sequence of events quite parallel to that in pulpy-kidney disease is the cause of death. The same type of *B. welchii* finds conditions in the intestine suitable for growth and toxin production. Absorption of the toxin from that site kills. This disease is almost exactly our counterpart of the " Infectious Enterotoxæmia " of sheep in Western Australia which Bennetts so thoroughly studied. We have recently shown that some of the deaths which occur among sheep folded on special crops are true " Strike."

In one area in North Wales we found that a disease closely resembling " Strike" was responsible for serious loss. It, too, occurred in spring and was characterised by sudden death, but a tendency to a blackening of the muscles very soon thereafter rather differentiated it from true " Strike." The post-mortem picture showed greater congestion of the vessels of the intestine, more marked excesses of the body fluids which were frequently blood-stained, and much less congestion of the kidney. It is apparently of exactly the same nature as " Strike," but caused by a different type of *B. welchii* that is now known as Type C. This is the bacterium which McEwan's earlier and brilliant work on " Struck " of the Romney March incriminated as causing that disease in similar fashion, although it seemed that here there was a greater tendency for the organism to invade the body prior to death.

The remaining disease of which I must speak is probably by far the most serious sheep disease in this country, lamb dysentery. Although it must have existed in isolated districts for many years, it only came prominently to notice in 1919 and since then it has appeared in, or spread to, many parts of this country. This is a disease of quite young lambs and rarely causes death if the lamb survives for 10 days. The affected lamb is dull, lies for long periods, sucks little and often shows a curious haggard facial appearance. On rising it may stretch in a curious stiff fashion and emit a plaintive little bleat. Diarrhœa, often tinged with blood, is a prominent feature and few affected lambs recover. Infection may easily be brought into a flock by the purchase of " couples " (ewes with young lambs at foot) or by vermin carrying dead lambs or pieces of intestine from infected farms, but it is often impossible to say how the infection first reached the flock. Certainly ewes purchased in autumn rarely carry it to clean farms.

In the first year of infection only a very few of the late lambs are affected, and, as so often happens, little attention is paid to these losses. In the second and subsequent years the disease appears earlier in the lambing season and takes an increasing toll; even 30 per cent. of the lambs dying before they are ten days old. A proportion of cases show no illness and the carcase no marked abnormality beyond an intense inflammation of the intestine. More usually there is obvious illness for one or two days and a very typical ulceration of the wall of the intestine is found on post-mortem examination. Dalling's work has conclusively proved that the " lamb dysentery bacillus " (which is *B. welchii*, type B) is the cause of this disease; and to his work belongs all the credit for our being in a position to obtain highly satisfactory prophylactic inoculations. There is good evidence that the lamb is born unaffected but, on infected farms, the germ can readily be isolated from the soil. It is very probable that the newborn lamb in its first gasps for breath, or with its first sucks from a soil contaminated udder, becomes infected. Multiplication of the germ occurs in the intestine and, with it, production of the very lethal toxin which causes the ulceration (so producing conditions still more favourable to the germ) and a toxin death. The affected lamb spreads on to the pastures a myriad of these germs and so keeps up or increases the risk to lambs yet unborn. Obviously the immediate removal of affected lambs and the destruction of carcases play a part in the control of the disease.

Apart from my mention of the vaccine for the prevention of braxy, I have, as yet, said little of the products available for the control of pulpy-kidney disease, "Strike," "Struck," and lamb dysentery, because I wish first to attempt to illustrate the most fascinating position which the study of these members of the *welchii* group of bacteria has revealed. *B. welchii*, the original member of the group, came into real prominence through being responsible for much of the awful gas gangrene which killed and maimed so many men in the Great War. It is identified from other similar germs chiefly on the grounds of the type of toxin it produces. The toxin is always specific to the germ and the anti-toxin prepared in animals is equally specific. One, therefore, identifies unknown germs of this

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type by determining if their toxin is neutralised by an antitoxin of known specificity. Dalling's work on lamb dysentery opened a most interesting field. He found that, while the antitoxin prepared from the lamb dysentery bacillus would neutralise the toxin of *B. welchii*, the reverse was not the case. The toxin of the lamb dysentery bacillus, therefore, contained the *B. welchii* plus one or more other toxins. Then McEwen found that his *B. palidus* (*B. welchii*, Type C), which causes " Struck " in the Romney March, bore the same relationship to *B. welchii*, yet differed in its toxin from the lamb dysentery bacillus. To further complicate the picture, *B. welchii*, Type D. (Bennett's *B. ovitoxicus*) was found to have this relationship, yet its toxin differed from that of the lamb dysentery bacillus, but in a respect contrasting to that of McEwen's organism. Several really brilliant pieces of work, notably those of Glenny, Dalling and their colleagues, and of Wilsdon, have sorted out the tangle (at least for bacteriologists) and revealed what is an extraordinary interesting story. I do not claim scientific accuracy for my restatement of their findings but broadly, they showed that the lamb dysentery bacillus (*B. welchii* Type B) produces three toxins, X, Y and Z, the " Struck " organism (*B. welchii*, Type C) only two toxins, namely, X and Y, and the pulpy kidney and Strike organism (*B. welchii*, Type D) toxins X and Z, while the original *B. welchii* of war wounds now known as Type A, produces only one, the X toxin. The serum prepared against each of these germs will contain only antibodies for the toxin or toxins produced by the organism:

B. welchii Type A antiserum—neutralises only its own toxin.

B. welchii Type B antiserum—neutralises its own and all other toxins.

B. welchii Type C antiserum—neutralises its own and Type A toxins; failing against Type B and Type D, since it cannot neutralise the Z toxin.

B. welchii Type D antiserum—neutralises its own and Type A toxins; failing against Type B. and Type C, since it cannot neutralise the Y toxin.

These findings, bewildering as they may appear, are not simply of academic importance. They have a supremely practical bearing. Products to be used for the immunisation of animals against any disease must be capable of affording protection against all the toxins of the bacillus which causes it. As an example we would recall the history of lamb dysentery serum. Before the full story was known, efficient lamb dysentery serum had been produced for some years, when, unwittingly, the serum lost its Z antitoxin. In that year its efficiency in the field fell to a marked extent. Even since the significance of these various toxins has been known, attempts to market lamb dysentery serum devoid of one or more essential antitoxins have been made. Inevitably, they failed to prevent this disease and involved their users in considerable loss.

In the prevention of these diseases two main courses are open. One may inject a vaccine consisting of the organism and its toxin suitably modified, so that the animal is stimulated to produce for itself the necessary antibodies. Since

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this takes some little time, vaccination must be completed about two weeks before loss from the disease is expected. On the other hand one may inject serum, usually obtained from horses which have been immunised to a high level, which contains the necessary antibodies. In this case an immediate protection is obtained but it is not a lasting one, for it rapidly decreases after about three weeks. In pulpy kidney disease suitable serum has been used with what appear to be satisfactory results, the lambs being inoculated when about two weeks old. Australian workers have, I believe, vaccinated the lambs when quite young, but this practice has not been adopted in this country. In " Struck " of the Romney March, vaccination is practised on some affected farms, but the value of vaccination in " Strike " has not yet been proven. Lamb dysentery occupies a very special place when one considers the use of biological products. Since the disease attacks lambs at such an early age, their vaccination is impossible, but serum inoculation of the new-born lamb is attended by highly satisfactory results. The possibility of infection within the first few hours of life makes it necessary to inoculate early. It is inadvisable to delay beyond 12 hours of birth and serum administered to the new-born gives protection in almost every instance. The average death-rate of approximately 15 per cent. has, in many observations, been reduced to practically nil. But vaccination can be employed in a most interesting manner for the prevention of lamb dysentery. The ewe is vaccinated on two occasions, once in autumn and again within about 10 days of lambing. The lamb is born quite unprotected, but the antibodies, which the ewe produces as a result of vaccination, are poured down into the colostrum and with its first suck the lamb receives its immunity. Ewes inoculated in a previous season need only the second vaccination to stimulate their production of sufficient antibodies to pass on protection to the lamb. While ewe vaccination does not give quite as high a protection as does serum inoculation of the lamb, it is practicable where the latter cannot be employed (as in flocks lambing on hill pastures) and reduces lamb deaths to about 1 per cent.

Reviews

Actinomycosis. By Zachary Cope. London: Humphrey Milford, Oxford University Press, 1938, Pp. 248. 15s.

VETERINARIANS are familiar with the disease known as " lumpy jaw " in cattle, caused by the ray fungus, *Actinomyces bovis* (Wolff and Israel). It is not so generally known, however, that this organism is not infrequently the cause of disease in the human subject. In this monograph the author gives a concise account of the history and characters of the organism, the etiology and clinical description of the diseased conditions in man, and reviews critically the various methods of treatment. It is interesting to note that the organism was first isolated by Bollinger in 1877 from lesions in the jaw of cattle. Emphasis is made on the fact that *A. bovis* is an anærobe and a strict parasite, points which are of importance in the etiology and diagnosis of the disease processes for which it is responsible. At the end of the book an extensive list of references is given which should prove invaluable to those working on this subject. The monograph is written in an attractive and readable style and, from the comparative aspect, should be of great interest to veterinary surgeons. N.J.S.

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Notices

MINISTRY OF HEALTH

An order has been issued from the Ministry of Agriculture and Fisheries that after and including April 1st the importation into this country of all meat, including bacon and ham, and also meat products such as canned meats, sausages, and sausage casing, will be permitted only if they are accompanied by an Official Certificate recognised by the Minister of Health, as evidence of satisfactory inspection and hygienic preparation. In addition to the Certificates already recognised for thirty-one countries, the Minister has now recognised Official Certificates for France, Kenya Colony, and South West Africa.

Further notices will be published from time to time setting out details of any additional Certificates which may be recognised for other countries.

The importation of certain defined classes of meat (such as scrap meat) continues to be prohibited.

Personal

Howard, Mr. Percy Sturton of Wanstead, E., veterinary surgeon (net personality £21,266), 24,260

Lieut-Col. A. J. Doherty, M.C., M.R.C.V.S., has been appointed Superintendent of the Zoological Gardens, Dublin. He succeeds Dr. B. B. Ferrar, F.Z.S., who retires after 25 years' service.

During the war Col. Doherty, who spent over 25 years in Kenya Colony reorganised the remount service in East Africa. At the close of the campaign he commanded the remount service and the veterinary service. He was awarded the Military Cross for gallantry.

He was at one time director of the Veterinary Department at Kenya, and was a keen hunter of big game.

Messrs. J. J. Parkinson, M.R.C.V.S., the well-known trainer and breeder of racehorses on the Curragh, and John James (Senr.) O'Donovan, M.R.C.V.S., D.V.S.M., Assistant Veterinary Inspector to the Corporation of Dublin, who were nominated on the Cultural and Educational Panel of the Veterinary Council have been elected to the Senate of the Dail.

It is good to note the practical interest our Irish Colleagues take in Parliamentary matters.

Publishers' Notices

All communications should be addressed to 7 and 8, Henrietta Street, Covent Garden, London, W.C.2. Telephone: Temple Bar 8568. Telegrams: "Baillière Phone, London."

Letters for the Journal, literary contributions, reports, notices, books for review, exchanges, new instruments or materials, and all matter for publication (except advertisements) should be addressed to the Editor.

Copy of advertisements should be in the hands of the publishers—Baillière, Tindall and Cox—not later than the 25th of the month, or if proof is required, not later than the 23rd.

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